NOTE: THIS REPORT WAS NOT SCANNED.

EPA SHOULD BE CONTACTED FOR THE ENTIRE REMEDIAL ACTION ON THIS SITE.

Pre-Remedial Design Study
Port of Tacoma Industrial Yard
Hylebos Waterway
Commencement Bay
Tacoma, Washington

Volume I

Prepared by
Hart Crowser

October 30, 1998
J-4858-03

CONTENTS

CONTENTS (Continued)

Page

TABLES

FIGURES

APPENDIX A
FIELD ACTIVITIES AND METHODS

CONTENTS (Continued)

TABLES

FIGURES

APPENDIX B
DATA VALIDATION SUMMARY

TABLES

APPENDIX C
SEDIMENT CHARACTERIZATION AND PHYSICAL TESTING

CONTENTS (Continued)

TABLES

FIGURES

VOLUME II

PLEASE NOTE:

Site/Parcel Numbering -- This notebook contains references to "Parcel 1," which has been the designation for the "Port Industrial Yard" property (401 Alexander Avenue) at the end of the Hylebos peninsula and at the Mouth of the Hylebos Waterway. See HCC "Summary of Existing Information" (January 1995). In the Trustees' Settlement Report, "Parcel 1" is designated "Site 56" and named the "AK-WA Shipbuilding Site."

This notebook also contains references to "Parcel 2," which has been the designation for the former Occidental property at 605 Alexander Avenue (but not including the former PRI Northwest property at 709 Alexander Avenue). Id. The Trustees' Settlement Report includes "Parcel 2" in "Site 57" named the "Occidental Site" (encompassing both the former Occidental and PRI properties).

AFFIDAVIT OF ALAN F. WESTON REGARDING PCB DISTRIBUTIONS ON THE EMBANKMENTS AND IN THE SEDIMENTS AT THE MOUTH OF THE HYLEBOS WATERWAY

STATE OF NEW YORK)
) ss:
COUNTY OF NIAGARA)

I, Alan F. Weston, being first duly sworn, state as follows:

I. EDUCATION AND EXPERTISE

1. I am Director of Remedial Programs for Glenn Springs Holdings, Inc., a subsidiary of Occidental Petroleum Corporation ("OPC"). I received a B.S. in Chemistry from the University of London in 1970, and a Ph.D. in Chemistry from the University of Kent at Canterbury in 1973. I was a Postdoctoral fellow at the National Mass Spectrometry Center at the University of Warwick from 1973 to 1975. My area of expertise includes Analytical Chemistry and particularly mass spectrometry ("MS") and gas chromatography ("GC"). I have been with OPC or its subsidiaries since 1978. I was Manager of the Mass Spectrometry and Separations Group at the Occidental Research Center from 1981 to 1985. I was Manager of Analytical Services from 1985 to 1997. I have been Director of Remedial Programs since 1997. I am responsible for directing all in-house and outside analytical chemistry resources for Occidental's environmental programs. These activities include procurement of analyses, QA/QC auditing and development of analyses for non-routine parameters. I have personally performed GC analyses for PCB compounds. I am also responsible for providing support to Occidental's environmental programs in the field of the environmental fate of chemicals.

II. THIS CHEMISTRY ASSESSMENT

2. I was requested to assess historical chemistry data from the Mouth Area of the Hylebos Waterway (referring to the area from Commencement Bay to the 11th Street Bridge. The historical data included: (a) the Hylebos Cleanup Committee's ("HCC") Round 1 results; (b) the sampling programs undertaken by Occidental to characterize the embankment areas at the properties referred to as Parcel 2 (605 Alexander Avenue) and Parcel 3 (709 Alexander Avenue); and (c) the 1994 shoreline sampling performed by the Port of Tacoma ("Port") at Parcel 1 (401 Alexander Avenue). I also was requested to assess additional samples gathered by Occidental in January of 1998 on the shoreline at Parcels 1 and 2. I understand that all of these data have been provided to TLI Systems and to the Document Repository established for the Hylebos Waterway Mediation/Allocation Process. In addition, I have reviewed the chromatograms and

quantitative reports generated during the laboratory analyses of much of these data. I understand that additional data are being gathered and generated by the HCC, Occidental, and the Port. Although that data will be helpful to further understand the Mouth area chemistry, the available data are sufficient for the analyses and conclusions described in this affidavit.

3. My assessments of these data focused upon PCB results, as discussed in detail below. In addition, I reached conclusions regarding the concentrations and distributions (or lack thereof) of PAHs, metals, and pesticides. This affidavit begins with a detailed discussion of the PCB results, and concludes with my observations regarding other chemistry.

III. THE FOUR DISTINCT PCB PATTERNS IN AND NEAR THE MOUTH OF THE HYLEBOS WATERWAY

4. I was requested to assess the PCB data, and undertake analyses of the pertinent GC results, for the sampling that has occurred on the embankments (generally the shoreline area that includes the intertidal zone and immediately above that zone) and in the sediments at the Mouth of the Hylebos Waterway. The purpose of my efforts has been to determine whether any conclusions can be drawn regarding patterns of PCBs detected at those locations. Sometimes such analyses are described as "fingerprinting" PCBs.

5. Based upon my work with the data and sampling results, I have concluded that there are four very distinct and different patterns (or "fingerprints") of PCBs in the embankment, intertidal, and subtidal areas known as Parcel 1 (401 Alexander Avenue), Parcel 2 (605 Alexander Avenue), Parcel 3 (709 Alexander Avenue), and the Mouth of the Hylebos Waterway. The physical locations of the four PCB patterns are illustrated on the attached Figures 1 and 2 (using a different color for each pattern), and are associated with the following different landfill locations: (a) the "C Landfill" on Parcel 2 (containing one of the four patterns) (located near the Parcel 1 boundary); (b) the "N Landfill" on Parcel 2 (containing one of the patterns) (located near the Parcel 3 boundary); and (c) the "Navy/Todd Dump" on Parcel 2 (containing two of the four patterns) (also located near the Parcel 1 boundary). With the exception of a very few isolated samples in which congeners reveal no identifiable patterns, all of the rest of the surrounding area correspond with the PCBs found in the Navy/Todd Dump. That is, the Navy/Todd Dump contains the same Aroclor 1260 PCB pattern found in the remainder of the Parcel 2 embankment, the Parcel 1 embankment, the Parcel 3 embankment, and all of the proximate sediments in the Mouth of the Waterway (see the blue notations on Figures 1 and 2). Furthermore, the Parcel 1 intertidal area and the Navy/Todd Dump contain the highest concentrations of PCBs detected in any of these locations (24,000 ppb and 22,100 ppb, respectively). The PCB patterns associated with the C Landfill and the N Landfill are unique, and are unrelated to any PCB patterns in the Hylebos sediments. The PCB patterns and concentrations establish that Parcel 1 and the Navy/Todd Dump were the primary sources of the Aroclor 1260 PCBs in the Mouth area.

6. More detail regarding my work, and my conclusions, is set forth below. However, to further clarify the conclusions described in this paragraph, I have prepared the following table:

LOCATION	PATTERN Aroclor 1260	PATTERN C Landfill	PATTERN N/T Sludge	PATTERN N Landfill
Mouth Subtidal	**yes**	no	no	no
Navy/Todd Dump	**yes—high (22,100 ppb)**	no	yes	no
Parcel 1 Bank	**yes**	no	no	no
Parcel 1 ITZ	**yes—highest (24,000 ppb)**	no	no	no
Parcel 2 Bank	**yes**	only at C Landfill	yes	no
Parcel 2 ITZ	**yes**	no	no	no
Parcel 3 Bank	**yes**	no	no	no
Parcel 3 ITZ	**yes**	no	no	no
C Landfill	**no**	yes	no	no
N Landfill	**no**	no	no	yes

IV. THE PCB DATA AND ANALYSES

7. Most of the historical samples gathered by the HCC, the Port, and Occidental were analyzed using a gas chromatograph with an electron capture detector ("GC/ECD") and PCB concentrations were identified in the resulting reports as Aroclors. Aroclors are composed of PCB congeners in specific ratios. There are 209 different PCB congeners and many Aroclors contain common PCB congeners. Laboratories determine the Aroclor present in a sample based upon the patterns formed by the PCB congeners. The Aroclor is then quantified based upon the magnitude of three to five of the PCB congeners.

8. My review of the GC/ECD results showed that the chromatograms for these samples were very complex, containing many peaks and elevated baselines, and that Aroclor identification was not straightforward. In an effort to compare the PCBs present in the subtidal and intertidal sediments with the PCBs present on the embankments, I re-evaluated all of the GC/ECD data based upon PCB congener patterns. All potential PCB congeners present were normalized as a percentage of the total PCBs present, and were plotted to show congener patterns. This method provided a more comprehensive means of characterizing the PCBs in these samples because it uses all of the PCB congener data available, instead of focusing upon a few peaks in the chromatograms.

9. To obtain further information about the PCB patterns observed in the GC/ECD data, in January of 1998, Occidental collected additional samples from locations along the embankments on Parcels 1 and 2, where PCBs had been detected previously. A total of seventeen samples (some composites) were collected from Parcel 2. One composite sample was collected from Parcel 1, after negotiating with, and obtaining consent from, the Port. That sample sought to replicate the HCC's sampling station 5203I, where PCBs had been detected at 24,000 ppb. Due to the highly complex matrices in the previously obtained GC/ECD data, high resolution gas chromatography/high resolution mass spectrometry (HRGC/HRMS) was used for the analysis of the new samples. HRGC/HRMS is a very precise technique for identifying and quantifying PCB congeners. Using HRGC/HRMS, samples can be analyzed for specific PCB congeners down to ppb levels, without interference from other chlorinated compounds.

V. ANALYSIS OF THE GC/ECD HISTORICAL DATA

10. Examples of the PCB congener patterns obtained from the GC/ECD historical data are attached as Graphs 1 through 7. These graphs include typical patterns for sediment samples collected from the Waterway, embankment samples collected from Parcel 1, and embankment samples collected from Parcels 2 and 3.

11. The GC/ECD data showed three different patterns of PCB congeners in these locations, as illustrated by Graphs 1 through 7. The data are summarized in Figure 1, indicating sample locations, PCB concentrations, and different colors for the three patterns.

A. The Aroclor 1260 Pattern—Navy/Todd Dump; Embankments on Parcels 1, 2, and 3; and the Waterway's Intertidal and Subtidal Sediments.

12. The highest PCB concentrations were detected in the samples collected from the Navy/Todd Dump. Those concentrations were 22,100 ppb (slag material); 6,250 ppb (sediment); 15,600 ppb and 4,460 ppb (both boreholes). The PCB congener pattern for these samples is shown in Graph 1, and matches Aroclor 1260 (compare Graph 1 with Graph 2—the standard pattern for 1260). Borehole samples around the Navy/Todd Dump also showed this PCB congener pattern (see Graph 3).

13. The GC/ECD data from Parcel 1, gathered in 1995 by the Port of Tacoma from the embankment area in four locations, all had the same PCB congener pattern as illustrated in Graph 6. That pattern is similar to the 1260 pattern observed in the Navy/Todd Dump samples.

14. The GC/ECD data from the sediments in the Mouth area, gathered by the HCC, all had similar PCB congener patterns (an example is illustrated in Graph 7). That pattern is also similar to the 1260 congener pattern observed in the Navy/Todd Dump samples, but appears to be more dilute.

B. The Pattern at the C Landfill.

15. A second PCB pattern was observed in the borehole samples from the vicinity of the C Landfill. This pattern was predominantly lesser chlorinated PCB congeners, as illustrated in Graph 4. This pattern was only observed in these samples, and in the embankment sample adjacent to the C Landfill. It was not observed elsewhere on the embankments of the three parcels, in any of the proximate intertidal sediments, or in any of the subtidal sediments in the Mouth of the Waterway.

C. The Pattern in the "Sludge" at the Navy/Todd Dump.

16. A third PCB pattern was observed in a sample of distinct "sludge" material located at the Navy/Todd Dump. That pattern was different from either of the other two patterns, and was predominantly lesser chlorinated congeners, as illustrated in Graph 5. That pattern was not observed in any other sample, anywhere.

VI. ANALYSIS OF THE 1998 HRGC/HRMS DATA

17. The 1998 HRGC/HRMS results are summarized in Table 1 and Figure 2. Corresponding congener pattern graphs are presented in Graphs 8 through 13. These results showed the presence of three different patterns located on the embankments of Parcels 1 and 2. The HRGC/HRMS patterns also were consistent with the patterns observed in the GC/ECD data. That is, two of the three patterns detected in the HRGC/HRMS results were evident in the GC/ECD data (the Aroclor 1260 pattern at most locations, and the unique C Landfill pattern). However, the HRGC/HRGC results showed one new pattern. Thus, the total of four unique patterns observed in the two data sets. The samples also revealed congeners that are associated with fillers used in investment casting waxes.

A. The Aroclor 1260 Pattern—Navy/Todd Dump; Nearly All of the Remainder of the Embankments.

18. Again, the highest PCB concentrations were detected in the slag and soil samples collected from the Navy/Todd Dump (22,000 and 17,000 ppb, respectively). These samples had a very strong PCB congener pattern (see Graph 8) that matched Aroclor 1260 (see Graph 9).

19. The majority of the other embankment samples taken from Parcels 1 and 2, including the Parcel 1 composite, showed the same Aroclor 1260 pattern observed at the Navy/Todd Dump. An example is depicted in Graph 10.

B. The Pattern at the C Landfill.

20. Once again, a distinct PCB congener pattern similar to that observed in the GC/ECD data was detected in samples from the C Landfill. That pattern was unique, and was observed at no other location, anywhere.

C. The Pattern at the N Landfill.

21. A different pattern was detected in one of two test pits at the N Landfill. However, the PCB concentration was very low (110 ppb). The other test pit sample had very low PCB congener levels (11 ppb) that did not have a distinct pattern.

D. Chlorinated Wax Compounds at the C Landfill and the Navy/Todd Dump.

22. In addition, the HRGC/HRMS data from the C Landfill and the nearby Navy/Todd Dump samples showed the presence of Cl9 and Cl10. They were not major components elsewhere. These congeners are not components of standard Aroclor mixtures, but are similar to Aroclor 1270 (a mixture of nonachlorbiphenyl and decachlorobiphenyl) or Fenchlor DK (technical grade decachlorobiphenyl). Those compounds were generally used as fillers in investment casting waxes. Those compounds are not known to be associated with any of the historical chemical production processes at Parcel 2.

VII. CONCLUSION REGARDING PCBs

23. Based upon the distinct patterns described above, and the PCB concentrations detected at various locations, I conclude that Parcel 1 and the Navy/Todd Dump were the primary sources of the Aroclor 1260 PCBs in the Mouth intertidal and subtidal sediments, as well as in the embankment areas.

VIII. OBSERVATIONS REGARDING THE CO-LOCATION OF PAHs AND PCBs

24. Total PAH concentrations were highest in the surface sediment samples collected along the embankment – the data ranged from 4,400 to 10,000 ppb. Generally lower total PAH concentrations were detected in the borehole and sludge samples, ranging from 290 to 2,100 ppb, with the exception of a borehole sample taken in the vicinity of the Navy/Todd Dump that contained 28,000 ppb.

25. The high PAH concentrations in the embankment surface sediment samples were detected in the locations where PCBs were also detected. PAHs are a component of petroleum. The co-location of PAHs and PCBs on the embankment surface could be explained by the transport of PCBs in petroleum oil along the surface of the Hylebos Waterway. Indeed, the mass spectra confirm the presence of petroleum products on the embankment.

IX. OBSERVATIONS REGARDING METALS

26. Metals concentrations were highest in the Navy/Todd Dump slag and sediment samples, and the surrounding borehole samples. Compared to the rest of the embankment, these samples contained higher concentrations of antimony, cadmium, chromium, copper, mercury, nickel, silver and zinc. Elevated levels of lead were detected at the Navy/Todd Dump, exceeded only by sampling at station 5209.

X. OBSERVATIONS REGARDING PESTICIDES

27. Pesticides were generally non-detect, with the exception of some low level heptachlor and DDD/DDE/DDT concentrations near the Navy/Todd Dump and the N Landfill. Pesticide detections in the historical data sets may have been the result of interferences in the sample matrices. That is, the pesticides may not have been present in the samples. I understand that the HCC in its Event 1A and 1B Data Report (June 3, 1996) (p. 33) indicated that, "[o]ther (non-confirmed) chlorinated pesticide hits (i.e., other than the DDTs and metabolites at the head of the waterway) are believed to be false positives since they are associated with samples showing generally high GC/ECD chromatographic activities." Use of GC/MS in the "selected ion monitoring" mode during the analysis of the 1998 samples showed that several compounds tentatively identified as pesticides by GC/ECD were not actually pesticides.

Alan F. Weston

Alan F. Weston

SUBSCRIBED AND SWORN to before me this 3rd day of April, 1998.

Christine L. Salaciński

NOTARY PUBLIC in and for the State of New York, residing at 1795 Baseline Road Grand Island, NY 14072

Christine L. Salaciński
Notary Public, State of New York
Qualified in Niagara County
My Commission Expires August 24, 19 98

TABLE 1
SAMPLE COLLECTION SUMMARY
HYLEBOS WATERWAY EMBANKMENT INVESTIGATION
OCCIDENTAL CHEMICAL CORPORATION
TACOMA, WASHINGTON
JANUARY 1998

Sample ID	Sample Point IDs	Location	Sample Date	Matrix	Sample Type	Sample Depth (ft. BGS)	Analyses
PT-010998-CFD-002/008/ 009/004/005/007/010	POT1, POT3, POT5, POT7, POT9, POT11	Port of Tacoma (Area 5203)	01/09/98	Sediment	Composite	Surface	(1)
CA-010898-JOS-010	BH-15	Area 9	01/08/98	Soil	Grab	2-8	(1)
CA-010898-JOS-009	BH-12	Area 9 (C Landfill)	01/08/98	Soil	Grab	3-8	(1)
CA-010898-JOS-008	BH-11	Area 9 (C Landfill)	01/08/98	Soil	Grab	2-7	(1)
CA-010998-MPT-018/ 019/020/028/029	E1, E2, E6, E18, E19	Area 9	01/09-11/98	Sludge	Composite	0-1	(1)
CA-010698-CFD-002	Navy Test Pit	Area 8 (Navy Dump)	01/06/98	Soil	Grab	3-3.5	(1)
CA-010698-CFD-003	Navy Test Pit	Area 8 (Navy Dump)	01/06/98	Slag	Grab	5-5.5	(1)
CA-010698-CFD-001	Navy Test Pit	Area 8 (Navy Dump)	01/06/98	Sludge	Grab	3.5-5	(1)
CA-010898-MPT-016/017/ 021/022/024/023/025/026/027/034/035/036	C7, C9, C10, C12, C14-18, C22-24	Area 3	01/08-10,12/98	Sediment	Composite	Surface	(1)
CA-010798-JOS-006	BH-16	Area 3	01/07/98	Soil	Grab	4.5-10.5	(1)
CA-010798-JOS-004	BH-7	Area 3	01/07/98	Soil	Grab	6-11	(1)
CA-010798-JOS-005	BH-5	Area 7	01/07/98	Soil	Grab	0-8	(1)
CA-011298-MPT-032/033/ 040/041/042/043/044/037/038/039/045/046/047	A17-20, B20-22, B24, B27, B28, B29-31	Areas 6-4 (Area 5209)	01/12-14/98	Sediment	Composite	0-1	(1)
CA-010698-MPT-012/015	A9, A10	Area 4	01/06-07/98	Sludge	Composite	0-1	(1)
CA-011198-MPT-030	D12	Area 3	01/11/98	Sediment	Grab	0-1	(1)
CA-010898-JOS-007	Test Pit 2	N Landfill TP-2	01/08/98	Soil	Grab	2-8	(1)
CA-010898-JOS-011	Test Pit 1	N Landfill TP-1	01/08/98	Soil	Grab	2-8	(1)
CA-010798-MPT-013/014	D1, D3	Area 3	01/07/98	Sludge	Composite	0-1	(1)

Notes:
ft. BGS Feet Below Ground Surface
POT Port of Tacoma
(1) SSPL PAHs, Pesticides/PCBs, and Metals
SSPL Site-Specific Parameter List (see Table 2)
SVOCs Semi-Volatile Organic Compounds
PCBs Polychlorinated Biphenyls

ANALYTICAL RESULTS SUMMARY
HYLEBOS WATERWAY EMBANKMENT INVESTIGATION
OCCIDENTAL CHEMICAL CORPORATION
TACOMA, WASHINGTON
JANUARY 1998

Sample Location:	*BH-15*	*BH-12*	*BH-11*	*BH-16*	*BH-7*	*BH-5*	*N Landfill TP-2*
Collection Date:	*01/08/98*	*01/08/98*	*01/08/98*	*01/07/98*	*01/07/98*	*01/07/98*	*01/08/98*
Units:	*ng/g*	*ng/g*	*ng/g*	*ng/g*	*ng/g*	*ng/g*	*ng/g*
PCB Congener Homolog Totals							
Total monoCB	ND 0.050	0.48	ND 0.050	1.4	ND 0.50	ND 0.050	ND 0.50
Total diCB	0.11	3.7	0.66	1.7	0.59	2.9	ND 0.50
Total triCB	2.3	100	12	5.4	6.6	140	0.52
Total tetraCB	4.8	290	89	28	64	500	ND 0.50
Total pentaCB	3.2	250	320	60	170	310	3.3
Total hexaCB	3.5	180	210	100	190	69	2.6
Total heptaCB	5.9	180	91	80	270	76	2.2
Total octaCB	6.2	240	85	20	120	78	ND 0.50
Total nonaCB	11	900	240	63	47	130	0.85
Total PCBs	37	2100	1000	560	870	1300	9.5

Notes:
PCBs Polychlorinated Biphenyls.
ND x Not detected at or above x.

ANALYTICAL RESULTS SUMMARY
HYLEBOS WATERWAY EMBANKMENT INVESTIGATION
OCCIDENTAL CHEMICAL CORPORATION
TACOMA, WASHINGTON
JANUARY 1998

Sample Location:	*N Landfill TP-1*	*Area 8 Navy/Todd Soil*	*Area 5203 Sediment*	*Area 8 Sediment*	*Area 5209 Sediment*
Collection Date:	*01/08/98*	*01/06/98*	*01/09/98*	*01/07/98 - 01/10/98, 01/12/98*	*01/12/98 - 01/14/98*
Units:	*ng/g*	*ng/g*	*ng/g*	*ng/g*	*ng/g*
PCB Congener Homolog Totals					
Total monoCB	ND 0.50	16	0.17	0.24	0.55
Total diCB	ND 0.50	31	2.2	1.7	1.8
Total triCB	2.4	65	15	60	8.4
Total tetraCB	21	350	53	320	67
Total pentaCB	43	1700	230	430	130
Total hexaCB	26	4700	190	200	84
Total heptaCB	16	9700	270	340	110
Total octaCB	3.5	4400	130	280	32
Total nonaCB	1.2	910	68	210	36
Total PCBs	110	22000	960	1800	470

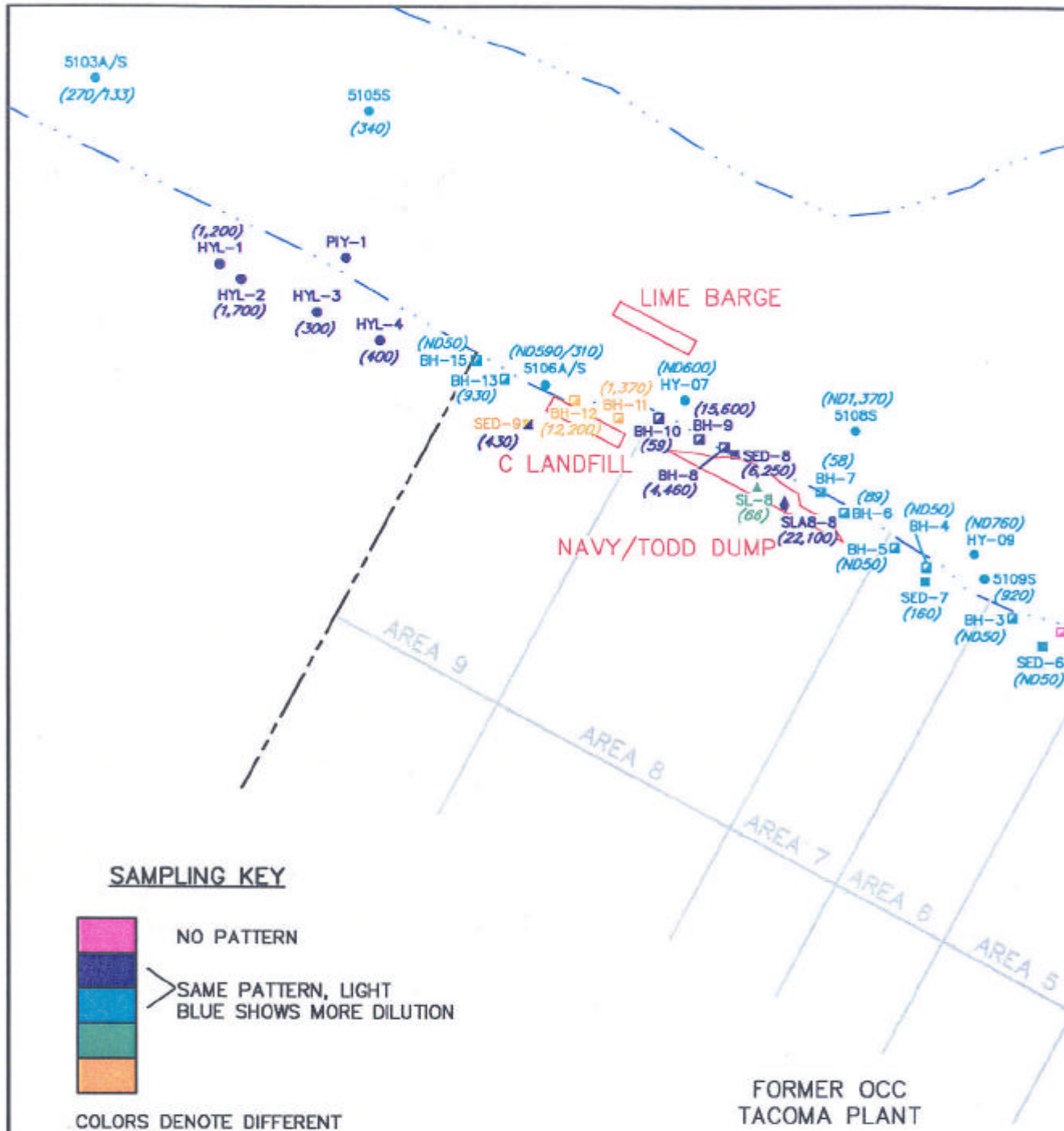
Notes:
PCBs Polychlorinated Biphenyls.
ND x Not detected at or above x.

ANALYTICAL RESULTS SUMMARY
HYLEBOS WATERWAY EMBANKMENT INVESTIGATION
OCCIDENTAL CHEMICAL CORPORATION
TACOMA, WASHINGTON
JANUARY 1998

Sample Location:	*Area 3 Sediment*	*Area 9 Sludge*	*Area 8 Navy/Todd Sludge*	*Area 4 Sludge*	*Area 3 Sludge*	*Area 8 Navy/Todd Slag*
Collection Date:	*01/11/98*	*01/09/98 - 01/11/98*	*01/06/98*	*01/06/98 - 01/07/98*	*01/07/98*	*01/06/98*
Units:	*ng/g*	*ng/g*	*ng/g*	*ng/g*	*ng/g*	*ng/g*
PCB Congener Homolog Totals						
Total monoCB	0.18	0.64	0.79	ND 0.50	2.3	9.8
Total diCB	1.0	4.8	1.7	ND 0.50	18	20
Total triCB	5.5	170	30	2.9	28	77
Total tetraCB	31	680	77	21	22	670
Total pentaCB	81	330	90	120	30	2600
Total hexaCB	36	41	170	240	16	3900
Total heptaCB	66	83	280	190	8.6	6800
Total octaCB	34	54	160	54	5.1	2900
Total nonaCB	26	48	110	40	4.1	460
Total PCBs	280	1400	920	670	130	17000

Notes:
PCBs Polychlorinated Biphenyls.
ND x Not detected at or above x.

FIGURES



SAMPLING KEY

NO PATTERN

SAME PATTERN, LIGHT BLUE SHOWS MORE DILUTION

COLORS DENOTE DIFFERENT PCB CONGENER PATTERNS.

LEGEND

●	WATERWAY SAMPLE LOCATION	■	SEDIMENT SAMPLE LOCATION
(63)	TOTAL AROCLOR CONCENTRATION (ug/Kg)	▲	SLUDGE SAMPLE LOCATION
A	BOREHOLE SAMPLE LOCATION	◪	BOREHOLE SAMPLE LOCATION
S	SURFACE SAMPLE LOCATION	♦	SLAG SAMPLE LOCATION
NDx	NOT DETECTED AT SPECIFIED LEVEL		

CRA

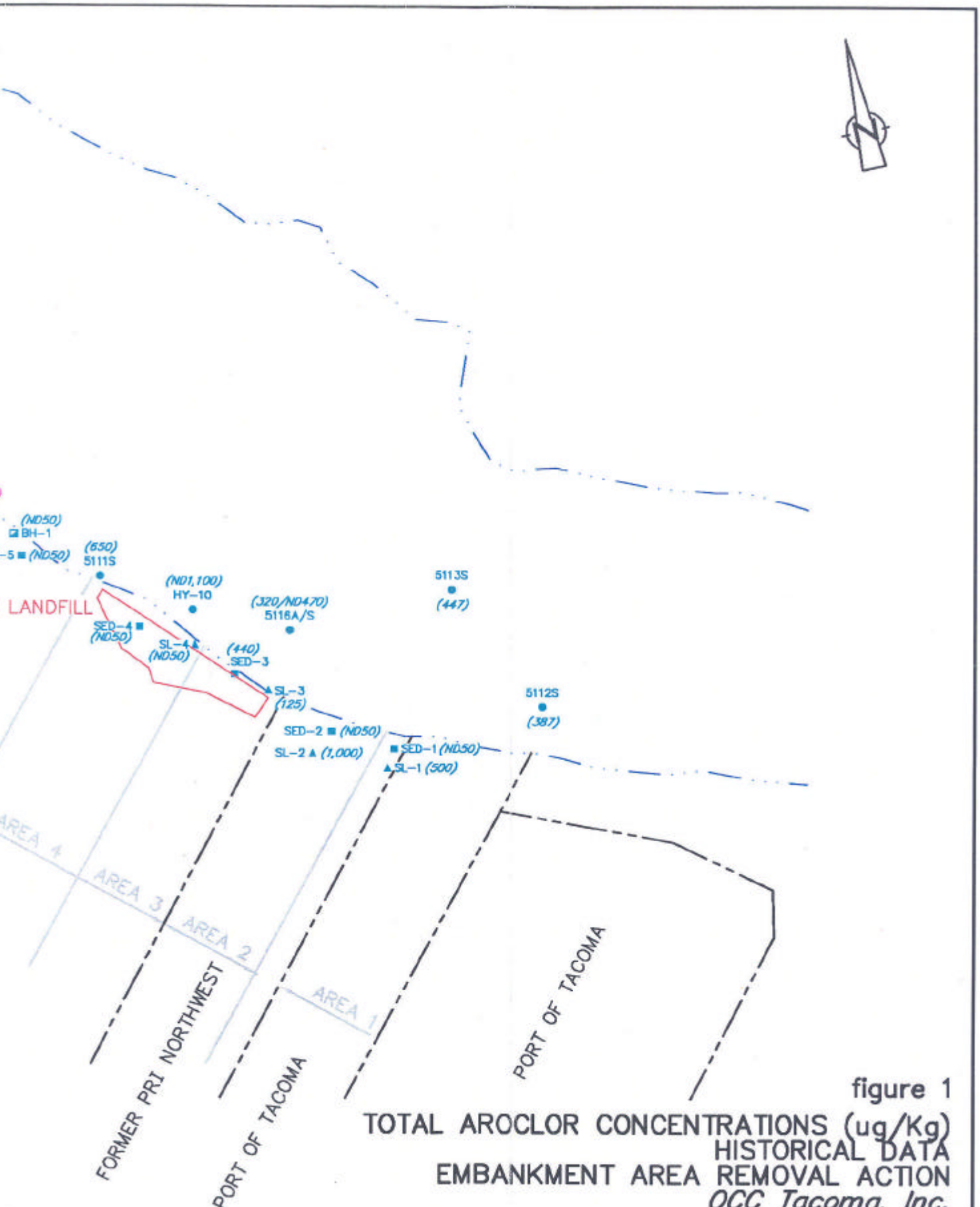
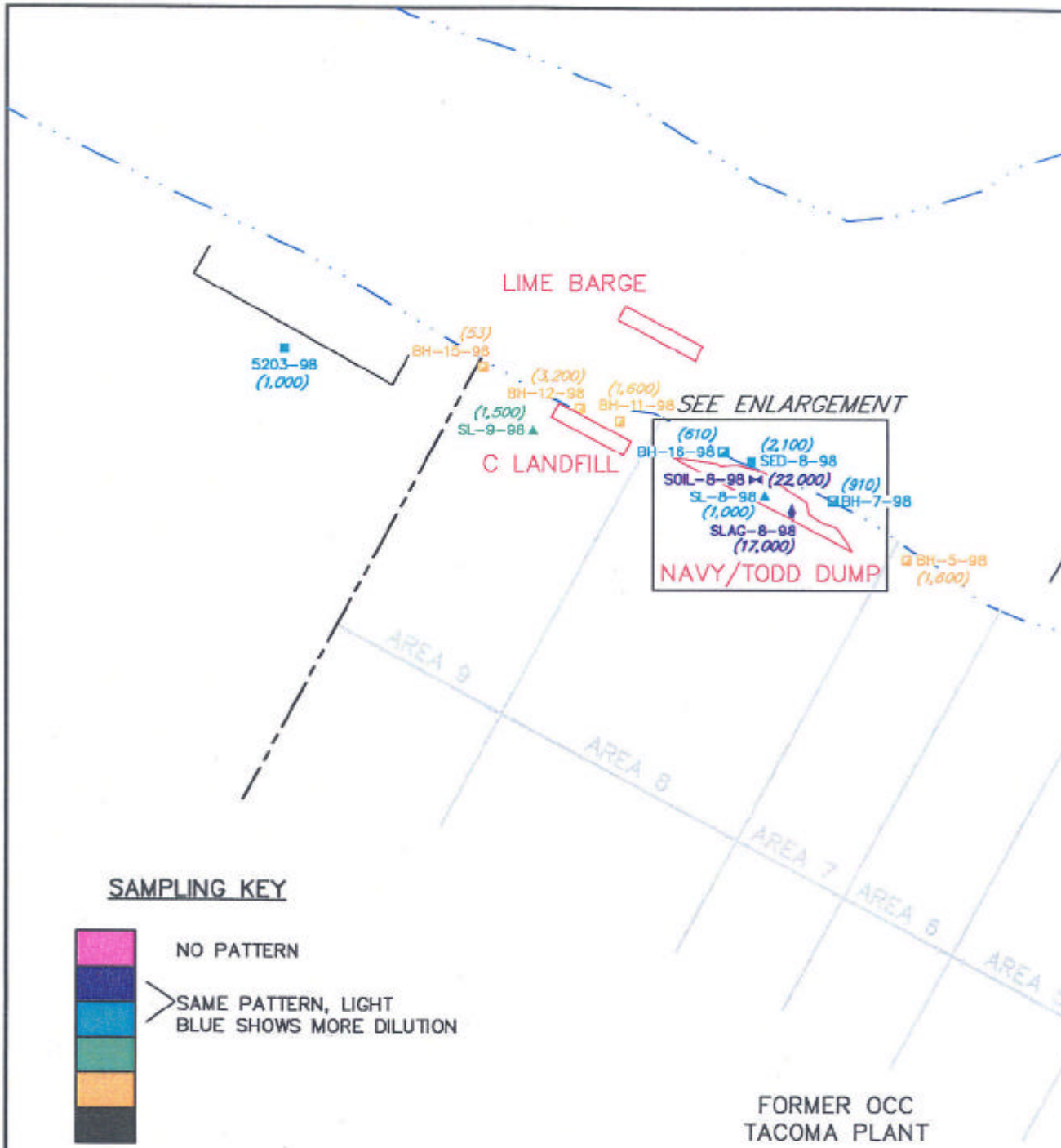


figure 1

TOTAL AROCLOR CONCENTRATIONS (ug/Kg)
HISTORICAL DATA
EMBANKMENT AREA REMOVAL ACTION
OCC Tacoma, Inc.



LEGEND

(63)	TOTAL AROCLOR CONCENTRATION (ug/Kg)	■	SEDIMENT SAMPLE LOCATION
A	BOREHOLE SAMPLE LOCATION	▲	SLUDGE SAMPLE LOCATION
S	SURFACE SAMPLE LOCATION	◪	BOREHOLE SAMPLE LOCATION
NDx	NOT DETECTED AT SPECIFIED LEVEL	♦	SLAG SAMPLE LOCATION
		◉	TEST PIT LOCATION

CRA

7842 (L) MAR 26/98(NF) REV.0 (P-80)

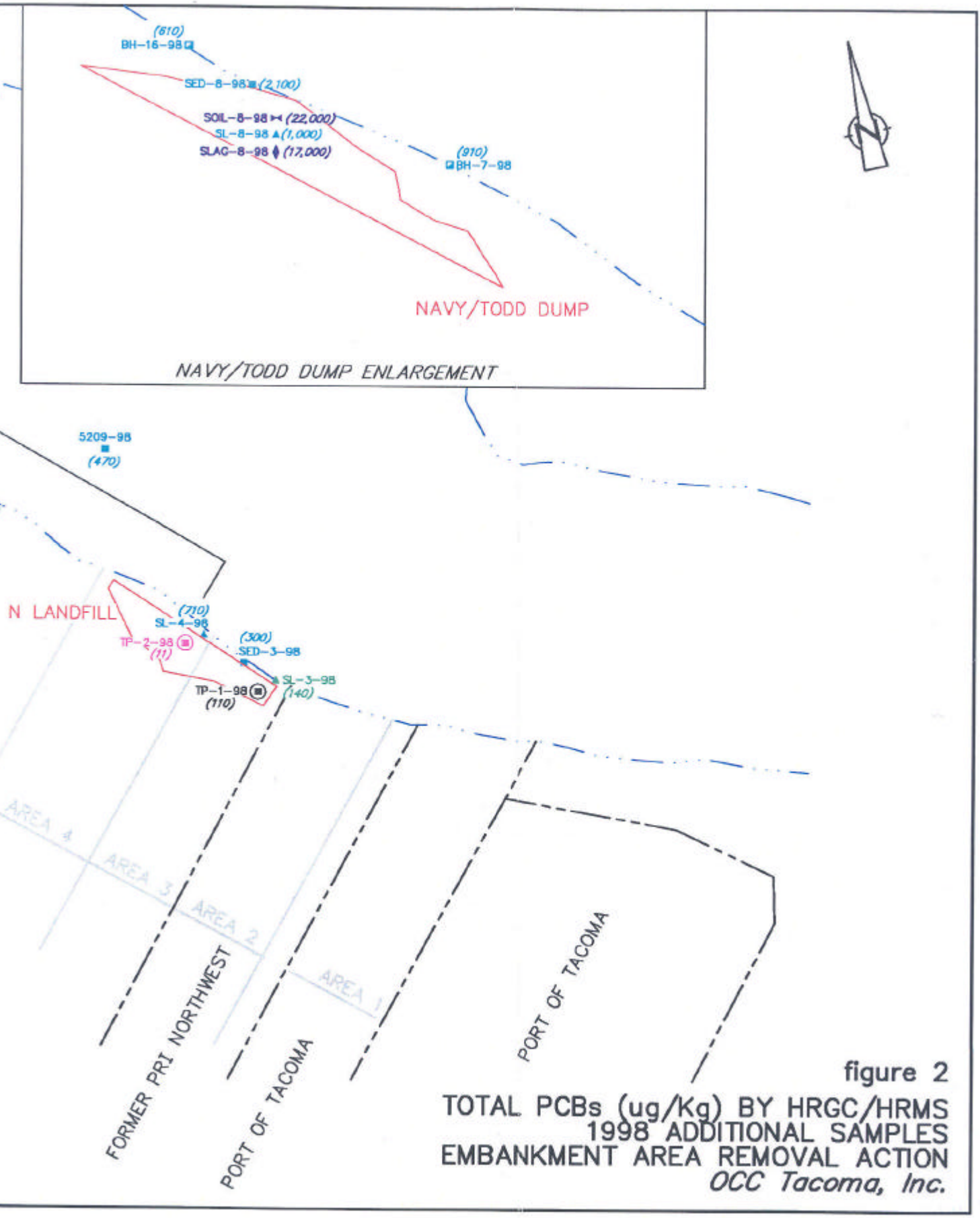
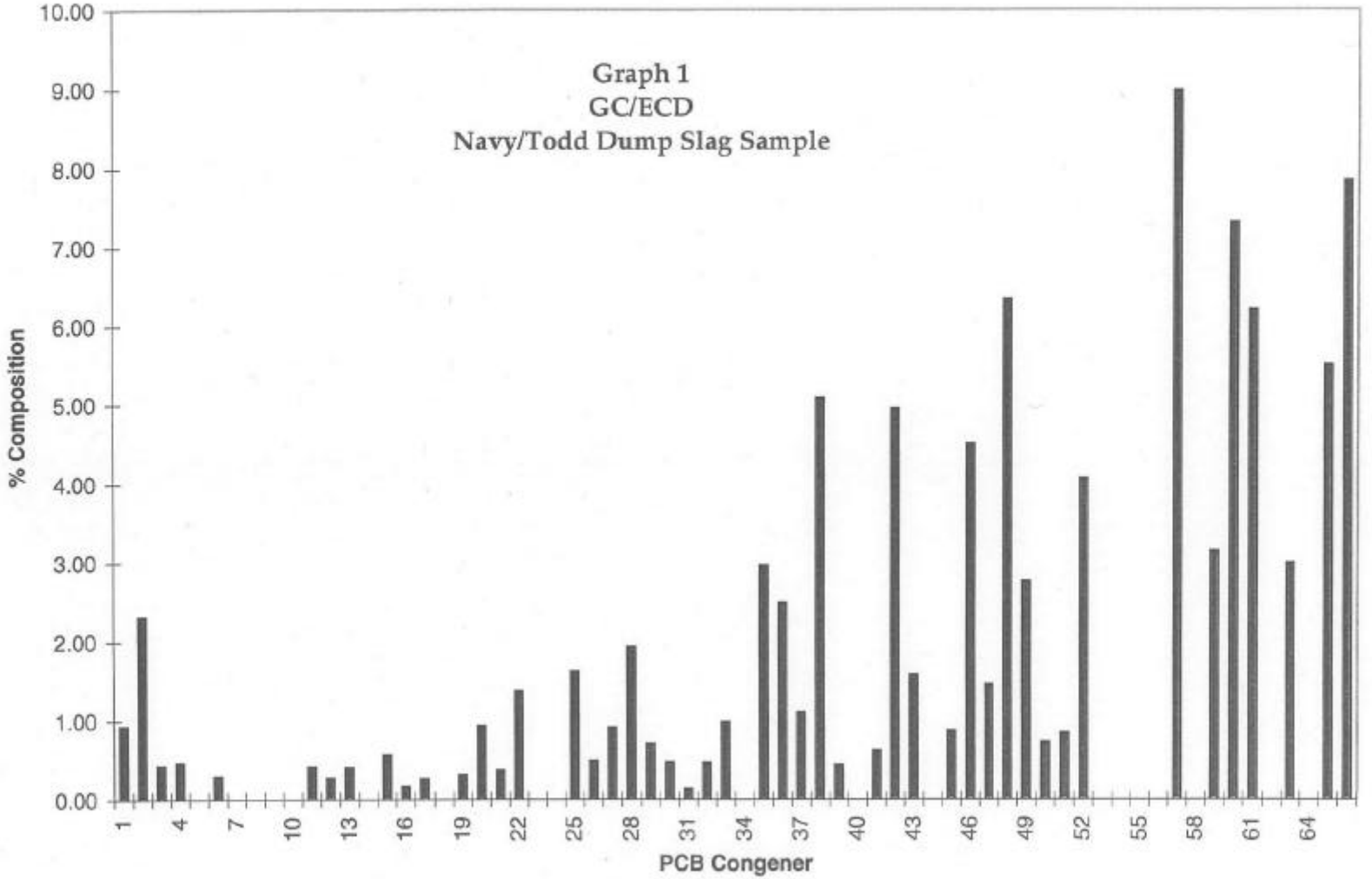


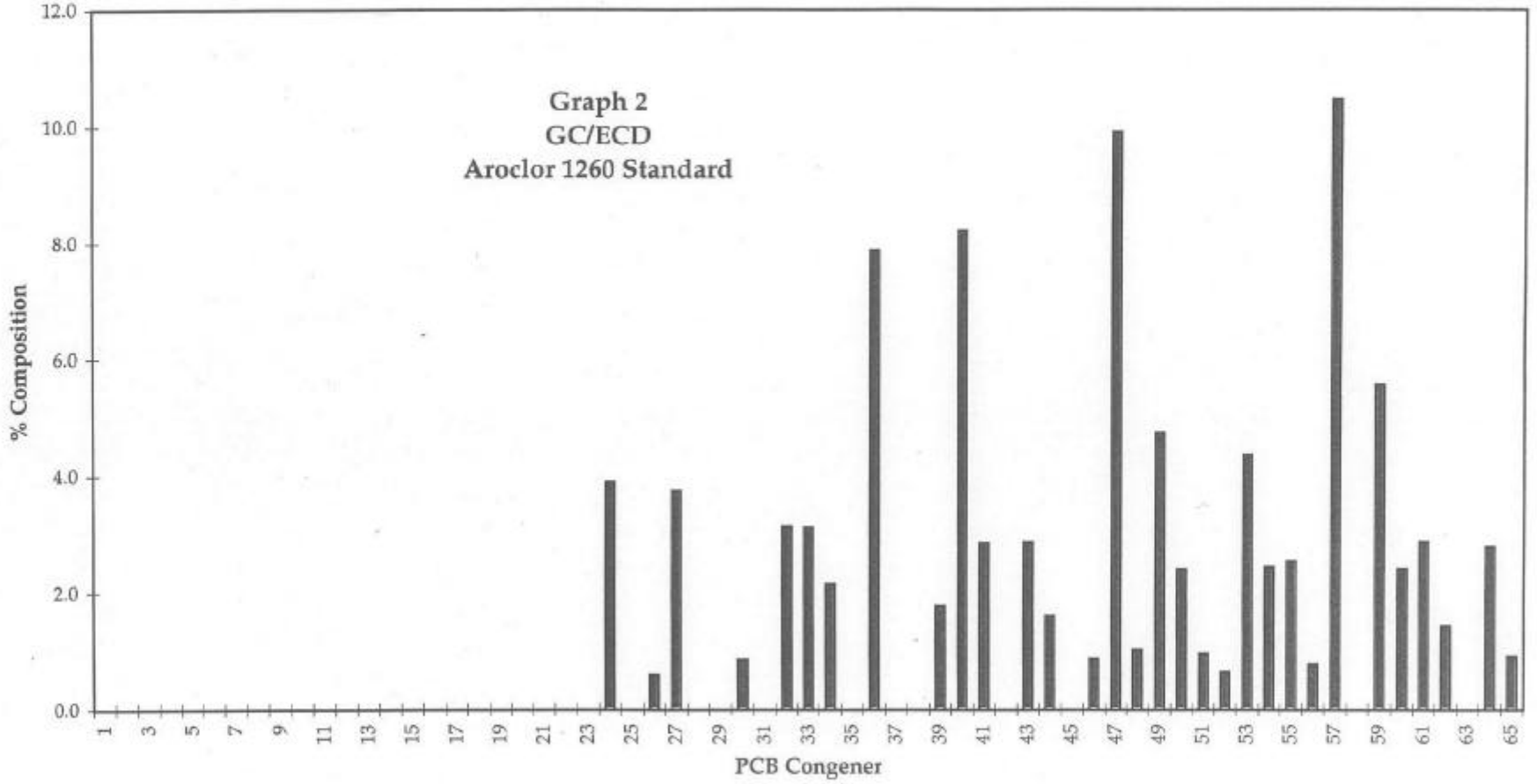
figure 2

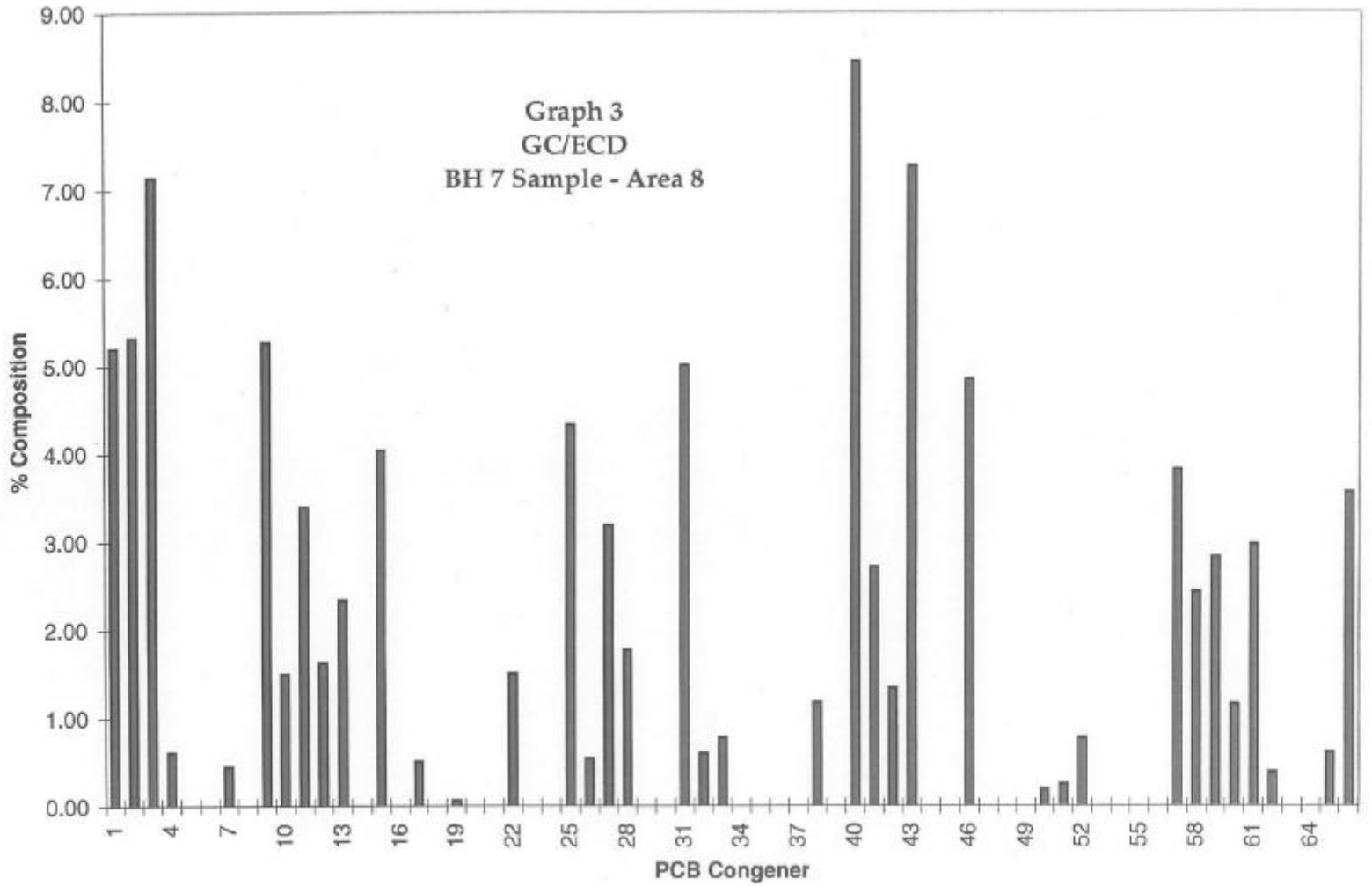
TOTAL PCBs (ug/Kg) BY HRGC/HRMS
1998 ADDITIONAL SAMPLES
EMBANKMENT AREA REMOVAL ACTION
OCC Tacoma, Inc.

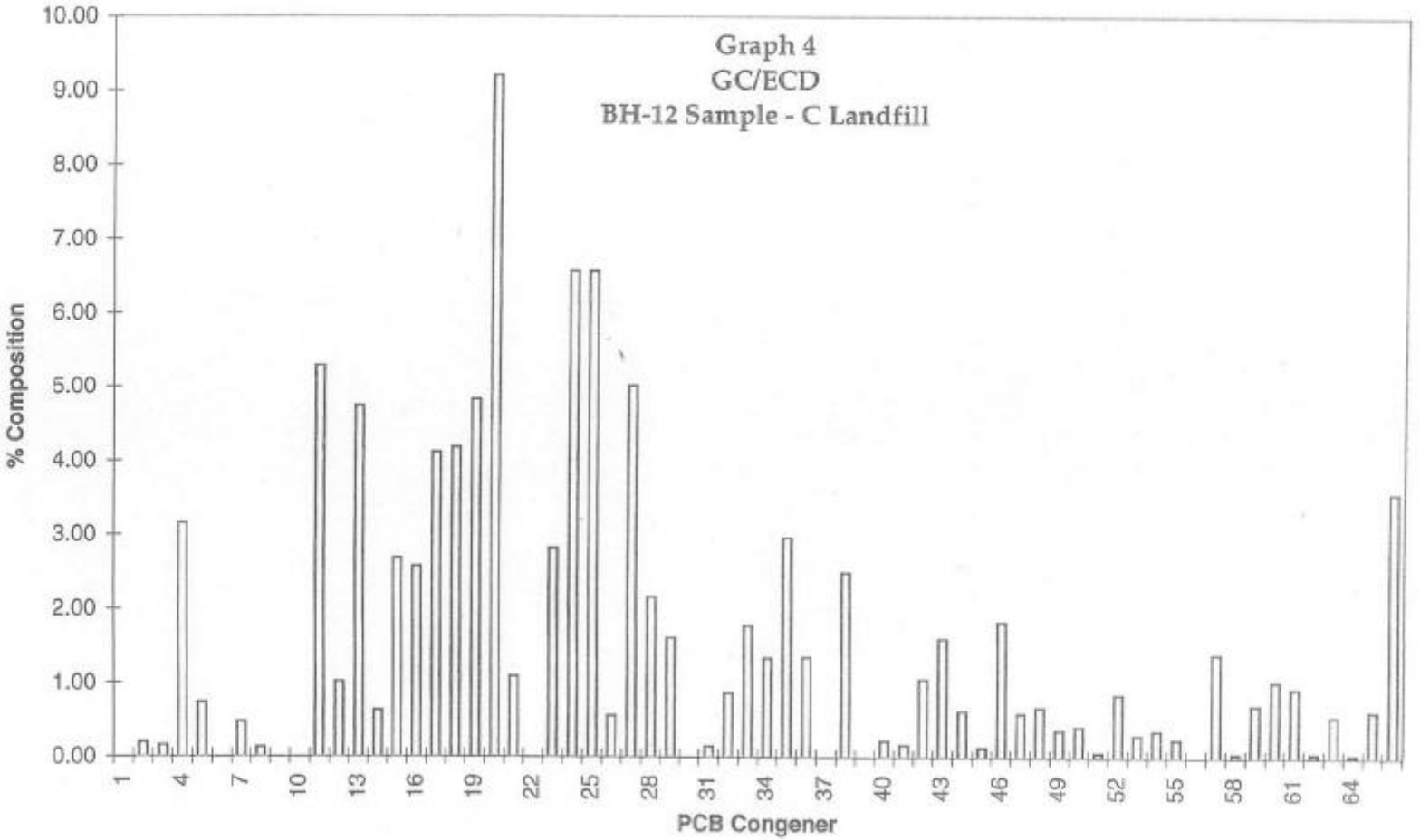
GC/ECD PCB CONGENER PATTERNS

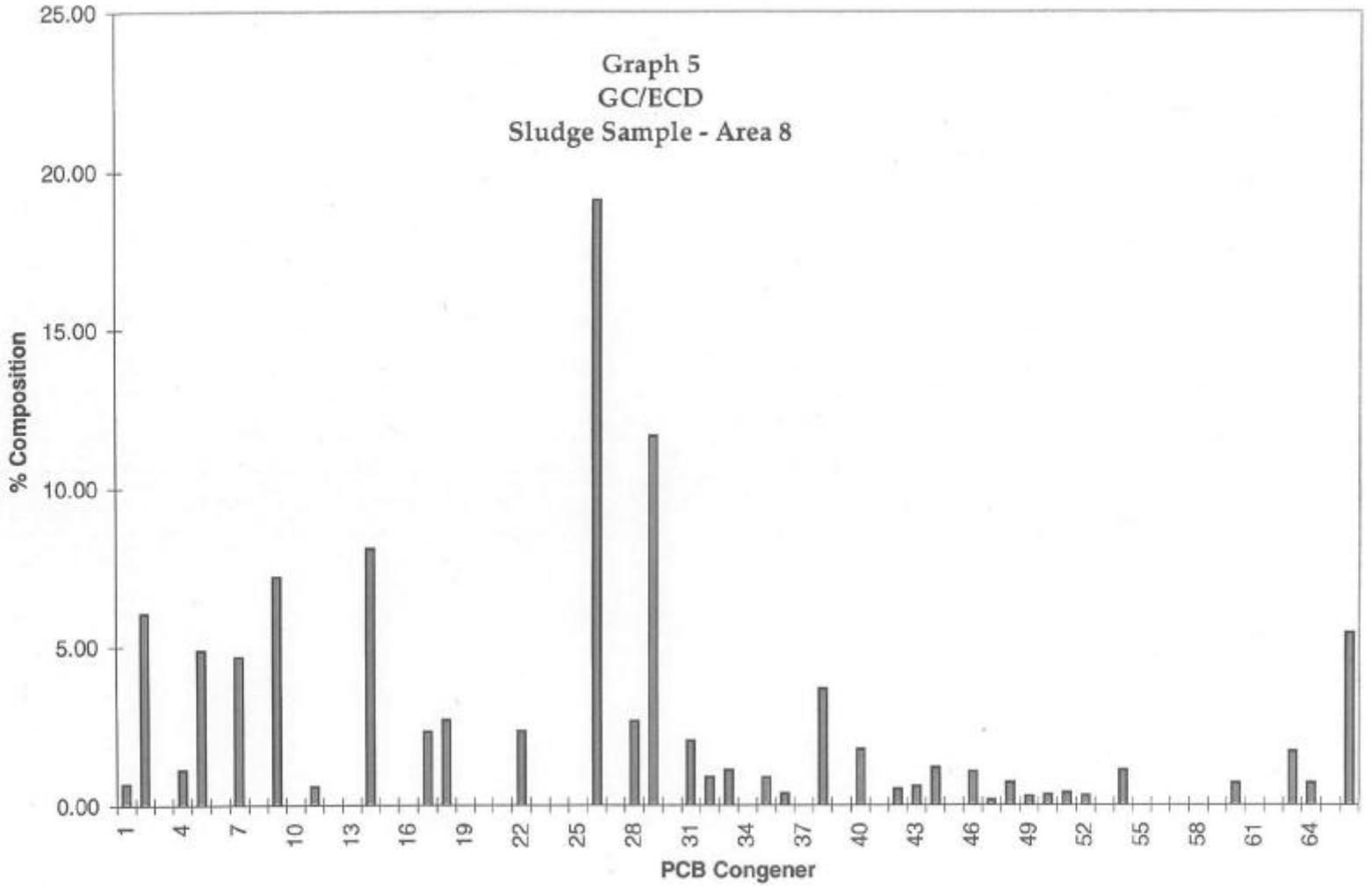
GRAPHS 1 - 7

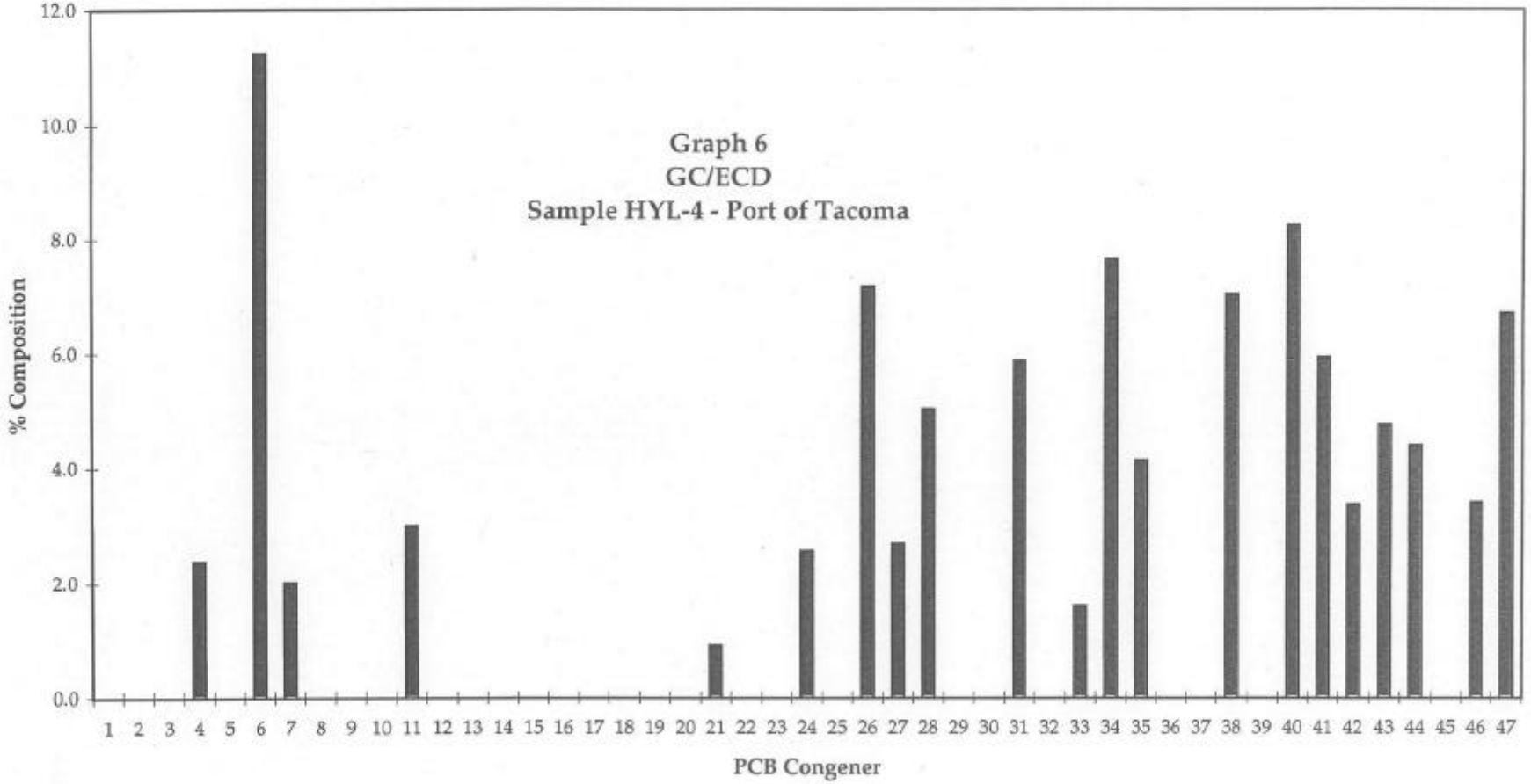

Graph 1
GC/ECD
Navy/Todd Dump Slag Sample
% Composition
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
1
4
7
10
13
16
19
22
25
28
31
34
37
40
43
46
49
52
55
58
61
64
PCB Congener

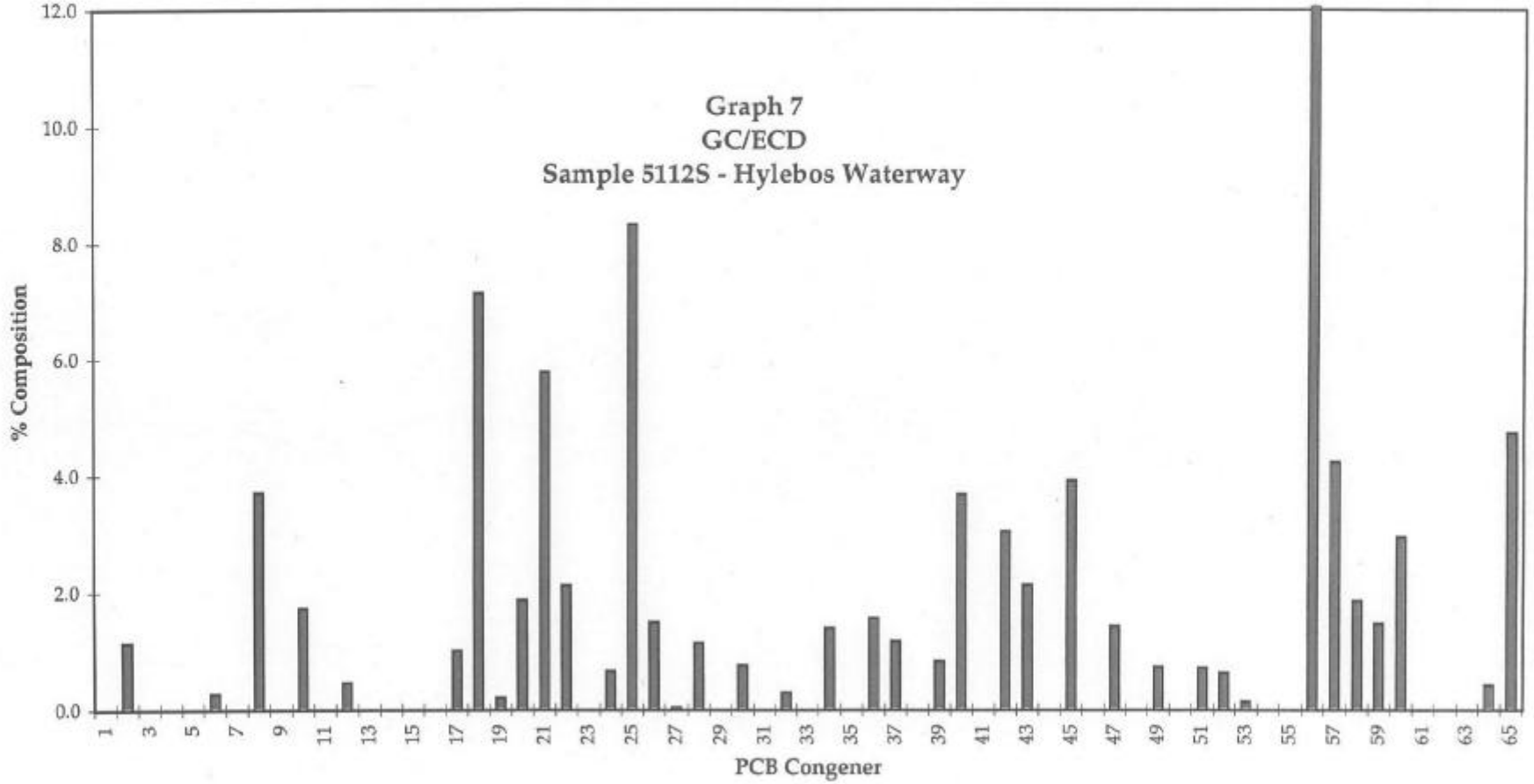

Graph 2
GC/ECD
Aroclor 1260 Standard
% Composition
12.0
10.0
8.0
6.0
4.0
2.0
0.0
1
3
5
7
9
11
13
15
17
19
21
23
25
27
29
31
33
35
37
39
41
43
45
47
49
51
53
55
57
59
61
63
65
PCB Congener


Graph 3
GC/ECD
BH 7 Sample - Area 8
% Composition
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
1
4
7
10
13
16
19
22
25
28
31
34
37
40
43
46
49
52
55
58
61
64
PCB Congener


Graph 4
GC/ECD
BH-12 Sample - C Landfill
% Composition
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
1
4
7
10
13
16
19
22
25
28
31
34
37
40
43
46
49
52
55
58
61
64
PCB Congener

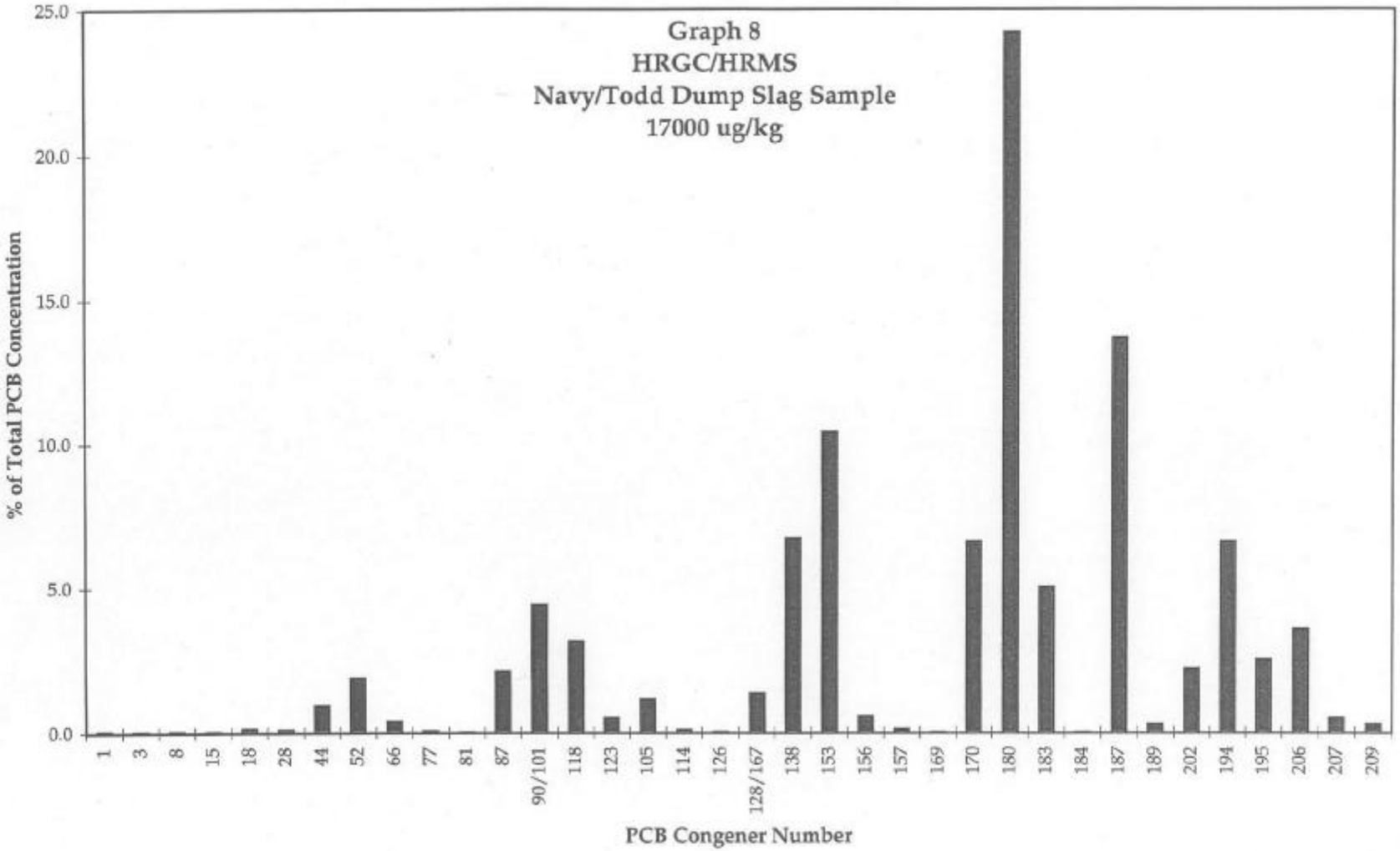

Graph 5
GC/ECD
Sludge Sample - Area 8
% Composition
25.00
20.00
15.00
10.00
5.00
0.00
1
4
7
10
13
16
19
22
25
28
31
34
37
40
43
46
49
52
55
58
61
64
PCB Congener

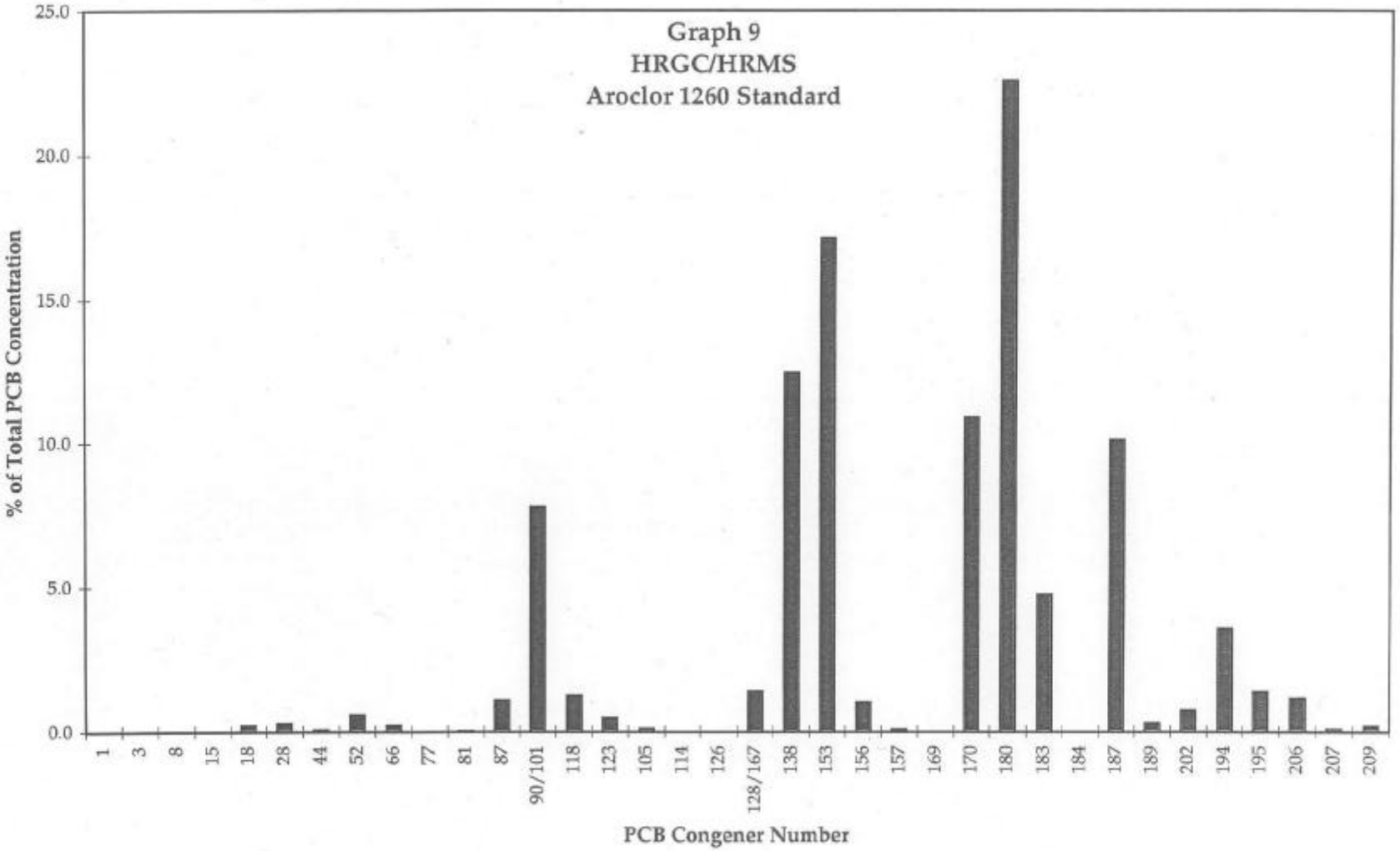

Graph 6
GC/ECD
Sample HYL-4 - Port of Tacoma
% Composition
12.0
10.0
8.0
6.0
4.0
2.0
0.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
PCB Congener

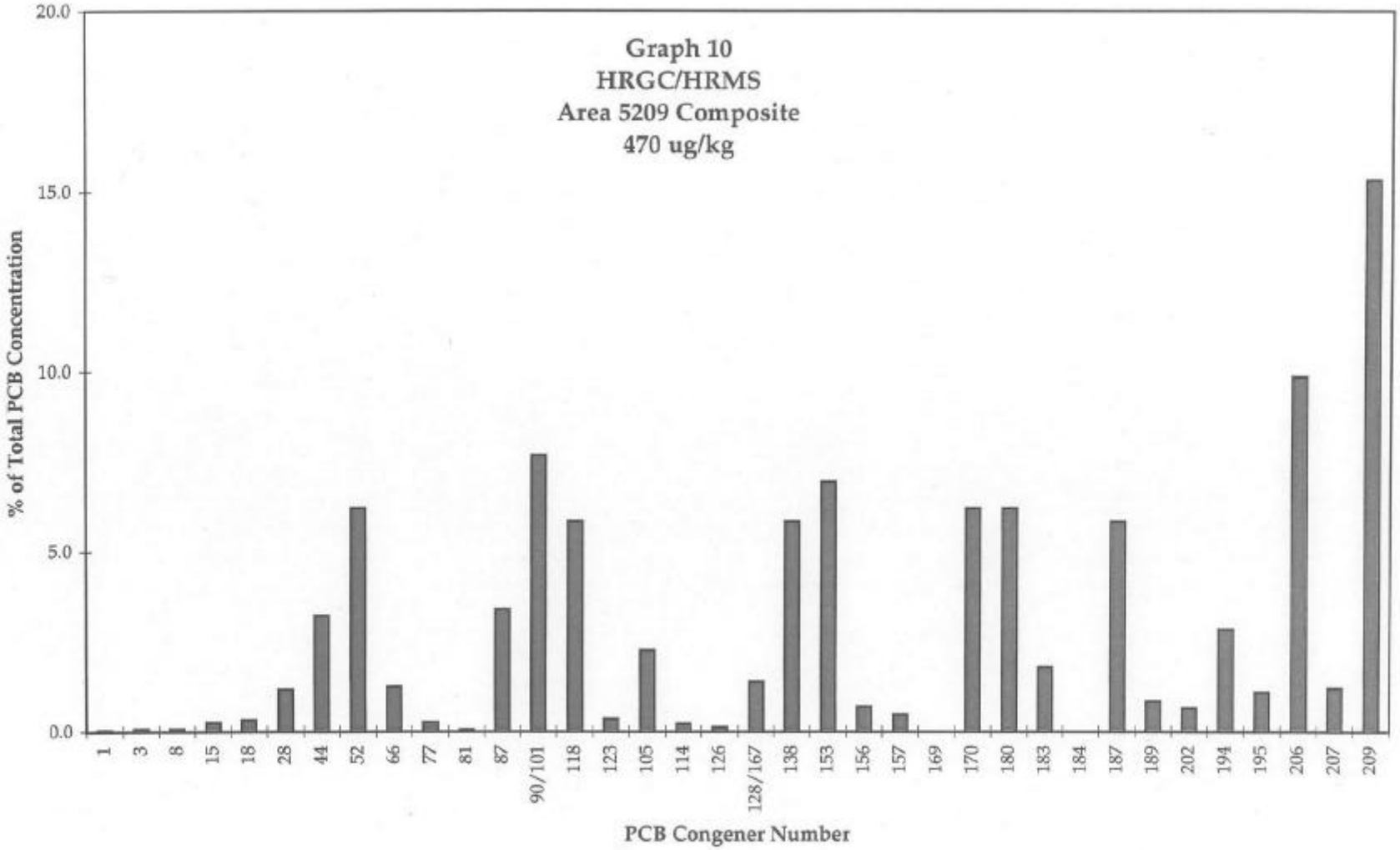

Graph 7
GC/ECD
Sample 5112S - Hylebos Waterway
% Composition
PCB Congener
12.0
10.0
8.0
6.0
4.0
2.0
0.0
1
3
5
7
9
11
13
15
17
19
21
23
25
27
29
31
33
35
37
39
41
43
45
47
49
51
53
55
57
59
61
63
65

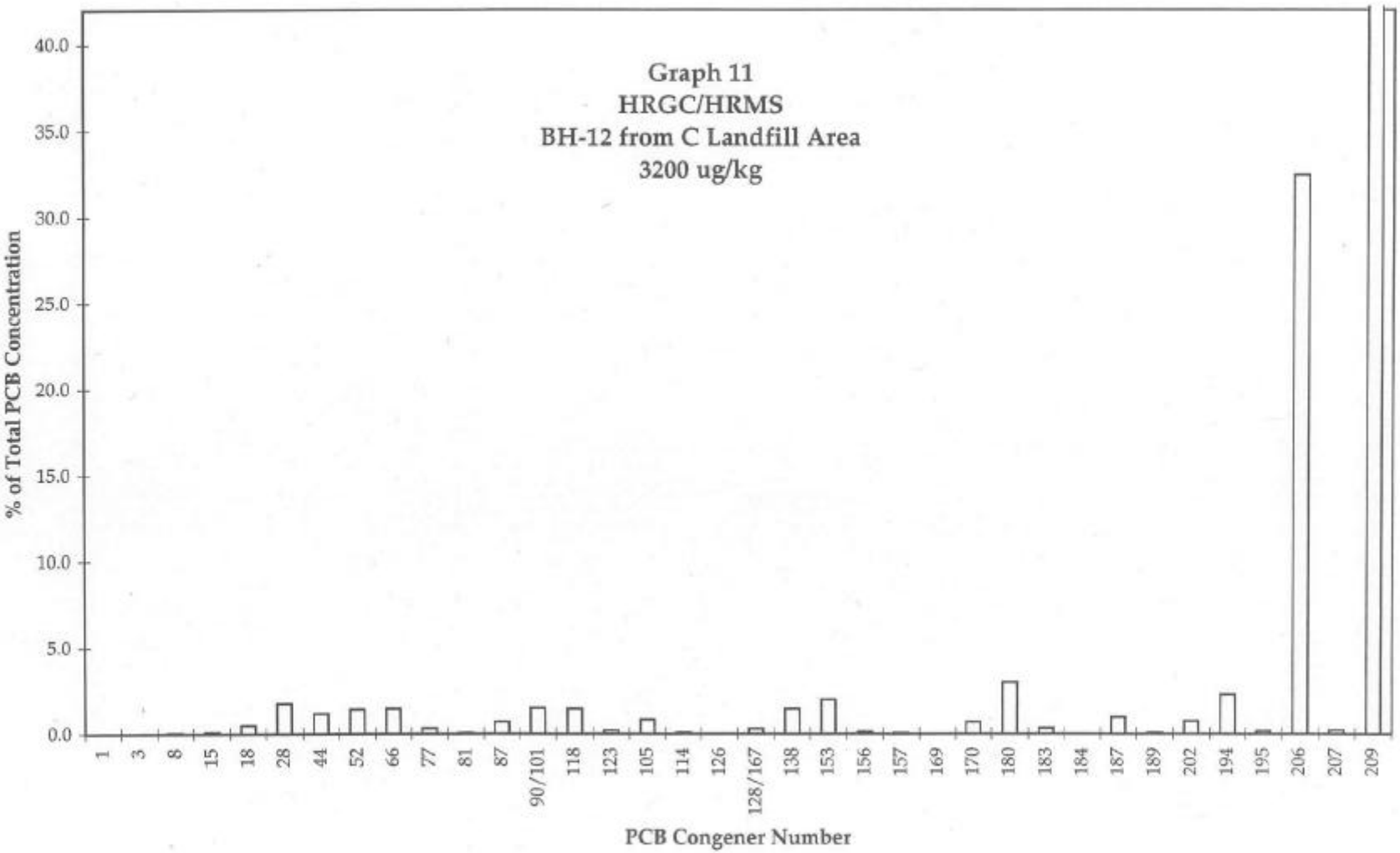
HRGC/HRMS PCB CONGENER PATTERNS

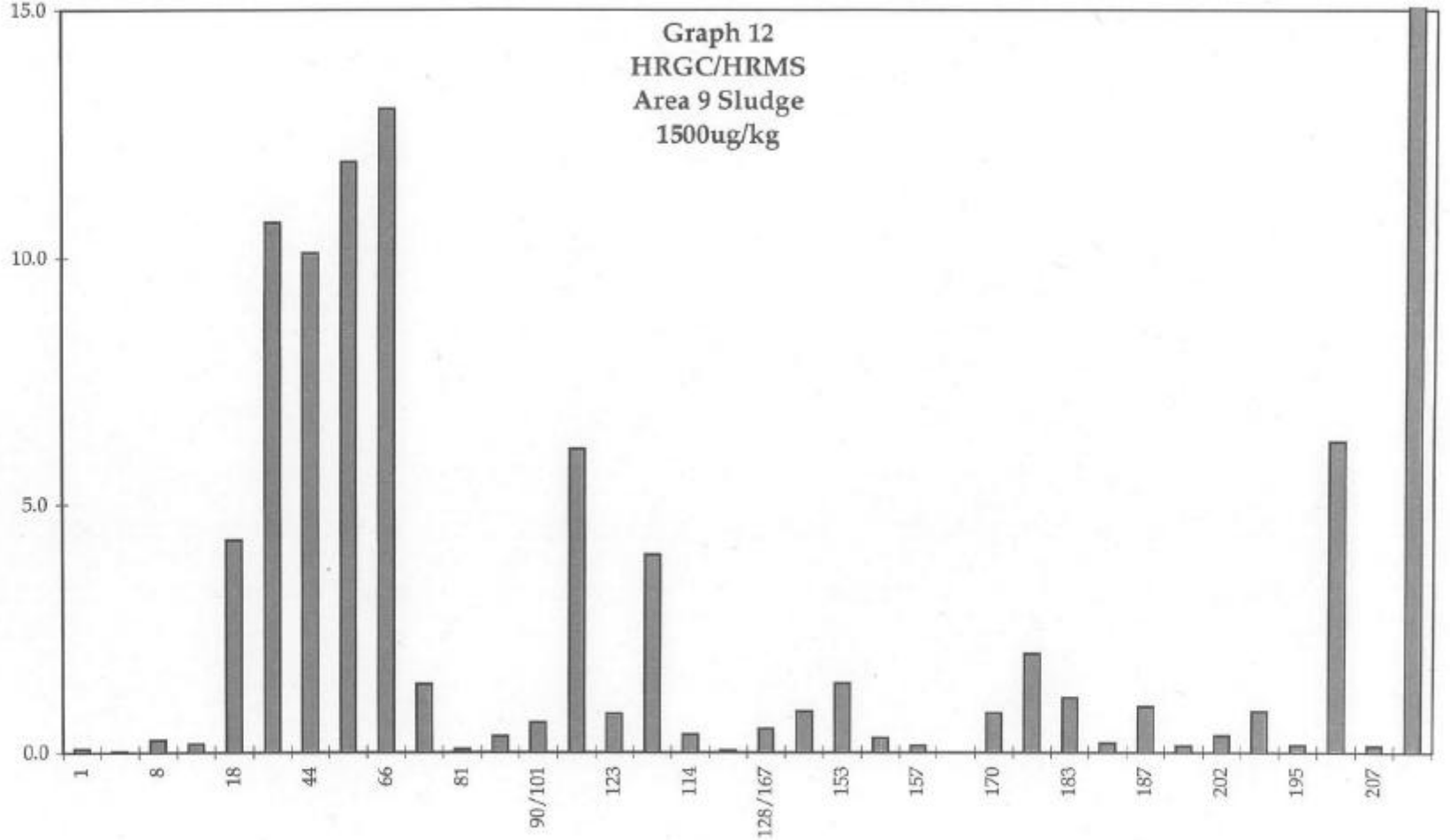
GRAPHS 8 - 13

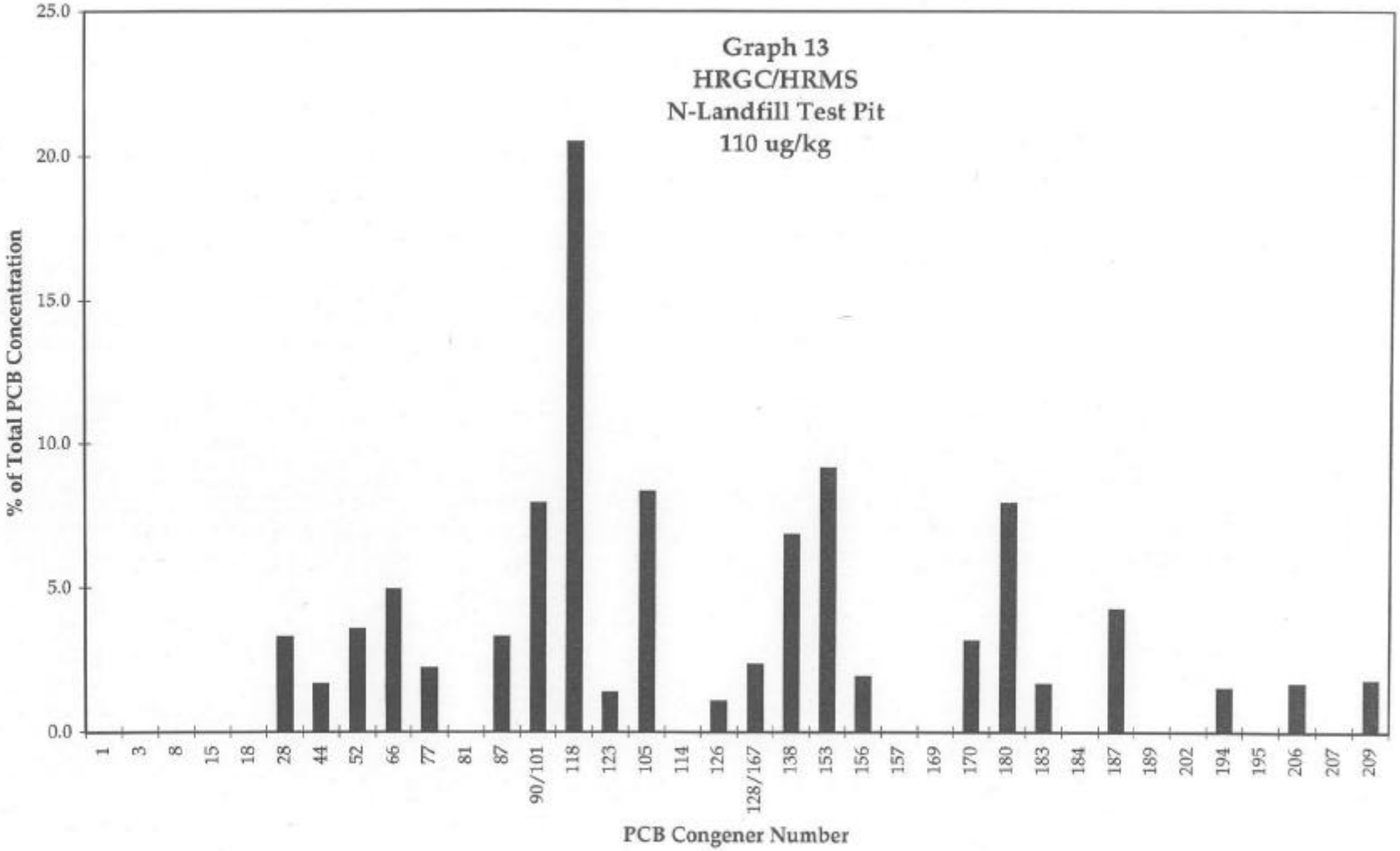

Graph 8
HRGC/HRMS
Navy/Todd Dump Slag Sample
17000 ug/kg
% of Total PCB Concentration
25.0
20.0
15.0
10.0
5.0
0.0
1
3
8
15
18
28
44
52
66
77
81
87
90/101
118
123
105
114
126
128/167
138
153
156
157
169
170
180
183
184
187
189
202
194
195
206
207
209
PCB Congener Number


Graph 9
HRGC/HRMS
Aroclor 1260 Standard
% of Total PCB Concentration
25.0
20.0
15.0
10.0
5.0
0.0
1
3
8
15
18
28
44
52
66
77
81
87
90/101
118
123
105
114
126
128/167
138
153
156
157
169
170
180
183
184
187
189
202
194
195
206
207
209
PCB Congener Number


Graph 10
HRGC/HRMS
Area 5209 Composite
470 ug/kg
% of Total PCB Concentration
20.0
15.0
10.0
5.0
0.0
1
3
8
15
18
28
44
52
66
77
81
87
90/101
118
123
105
114
126
128/167
138
153
156
157
169
170
180
183
184
187
189
202
194
195
206
207
209
PCB Congener Number


Graph 11
HRGC/HRMS
BH-12 from C Landfill Area
3200 ug/kg
% of Total PCB Concentration
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
1
3
8
15
18
28
44
52
66
77
81
87
90/101
118
123
105
114
126
128/167
138
153
156
157
169
170
180
183
184
187
189
202
194
195
206
207
209
PCB Congener Number


Graph 12
HRGC/HRMS
Area 9 Sludge
1500ug/kg
15.0
10.0
5.0
0.0
1
8
18
44
66
81
90/101
123
114
128/167
153
157
170
183
187
202
195
207


Graph 13
HRGC/HRMS
N-Landfill Test Pit
110 ug/kg
% of Total PCB Concentration
25.0
20.0
15.0
10.0
5.0
0.0
1
3
8
15
18
28
44
52
66
77
81
87
90/101
118
123
105
114
126
128/167
138
153
156
157
169
170
180
183
184
187
189
202
194
195
206
207
209
PCB Congener Number